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ABSTRACT

This study compares self-instructional (SI) and direct training (DT) effects on task performance of impulsive kindergarten children. Fifteen subjects with a mean age of 5.87 years and mean WPPSI IQ of 87.6 were randomly assigned to three groups: SI, DT and control. A pre-test, treatments, post-tests design which utilized Kagan's (1966) Matching Familiar Figures (MFF) Test, the Porteus (1965) Maze Test, and several sets of task items by Cattell, was employed. SI training was designed to teach subjects to use self-instructional verbalizations to guide their performance. The DT group received procedural instructions. The attention-control group practiced treatment group task materials for an equivalent time. There were two training sessions. One-way analysis of variance shows that training effects were significantly different from control effects in the second training session. No significant effects were found among MFF test scores across the pre- and post-testing sessions. Analysis of variance indicates the absence of generalization of training to performance on Raven's (1956) Coloured Progressive Matrices and the classification subtest from Cattell's (1950) Culture Fair Intelligence Test. Verbalizations of all subjects during testing were tape-recorded. No group differences in self-instructional verbalizations were found. Relations between verbalizations and test performance were low and nonsignificant. It is concluded that self-instructional training to improve the task performance of impulsive children should be reassessed. (RH)

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The Kamehameha Early Education Program (KEEP) is a research and development program of The Kamehameha Schools/Bernice P. Bishop Estate. The mission of KEEP is the development, demonstration, and dissemination of methods for improving the education of Hawaiian and Part-Hawaiian children. These activities are conducted at the Ka Na'i Pono Research and Demonstration School, and in public classrooms in cooperation with the State Department of Education. KEEP projects and activities involve many aspects of the educational process, including teacher training, curriculum development, and child motivation, language, and cognition. More detailed descriptions of KEEP's history and operations are presented in Technical Reports #1-4.

Abstract

The relative efficacy of self-instructional (SI) and direct training (DT) programs in the modification of impulsive behavior was examined in a sample of kindergarten children. Training in both programs consisted of modeling, prompts, and praise in shaping performance on a series of increasingly complex matching-to-sample and maze tasks. The primary difference between the programs was the target of training: the SI program trained self-instructions while the DT program trained attentional behaviors. In comparison to an attention-control condition, both programs were effective as assessed by the training records and the psttest Porteus Maze errors. However, there were no significant differences between the programs and no generalization effects for any of the three groups. Most importantly, there were no differences among the groups in the frequency of self-instructional and other verbalizations during posttesting, and there was no significant relationship between self-instructions and performance on the posttest. These results were explained and their implications discussed in terms of the failure of SI training to actually train the functional use of verbal self-instructions.

SELF-INSTRUCTIONAL VERSUS DIRECT TRAINING IN MODIFYING CHILDREN'S IMPULSIVE BEHAVIOR[1]

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The theoretical work of Luria (1961, 1969) and Vygotsky (1962) has generated considerable laboratory research on the relationship between self-verbalizations and nonverbal behavior. While some attempts have failed to replicate Luria's basic findings (e.g., Jarvis, 1968; Miller, Shelton, & Flavell, 1970; Wilder, 1969), other studies employing different response measures have demonstrated the efficacy of self-instructions to control nonverbal responses (cf. Wozniak, 1972). In addition, several experiments have shown that the use of self-instructions can reduce the frequency of rule-breaking behavior in laboratory analogue studies (Monahan & O'Leary, 1971; O'Leary, 1968) and resistance-to-temptation situations (Hartig & Kanfer, 1973).

Luria and Vygotsky have also inspired the construction of self-instructional training programs for impulsive and hyperactive children. Meichenbaum and Goodman (1971), in developing their training program, adopted the theoretical notion of a stage progression from external to internal verbal control of behavior. That is, in early years only the speech of others controls and directs the child's behavior; later, the child's own overt speech is able to regulate his behavior; and still later, the child's covert speech is capable of regulatory functions. The training program was modeled after this

developmental sequence with the goal of establishing self-instructional control over performance on standardized tests. The behavior-change procedures consisted of modeling, verbal prompting, and social reinforcement, with the child's overt verbalizations faded to the covert level and the difficulty level of the tasks increased over training sessions.

The efficacy of the program was demonstrated in two studies, the first involving second-graders with behavior problems and the second involving impulsive kindergarten and first-grade children (Meichenbaum & Goodman, 1971). The first study showed that, relative to attention and assessment control groups, the self-instructional training Ss significantly improved their performance on the WISC performance subtests, the response time measure of Kagan's (1966) Matching Familiar Figures (MFF) Test, and the Porteus (1965) Maze Tests. The second study examined the role of the modeling component in the training program by comparing the MFF performance of self-instructional training, modeling-only training, and attention-control groups. Using impulsive children, significant effects were found on the response time measure, with the self-instructional Ss increasing their response latencies most, followed by the modeling-only Ss and the control Ss. In contrast to the first study, significant effects were also found for the self-instructional Ss on the MFF error measure, while no effects were found for the modeling-only group which did not differ from the control group.

In a parallel development, Palkes and her colleagues (Palkes, Stewart & Kahana, 1968; Palkes, Stewart & Freedman, 1971) have also constructed a self-instructional training program on the basis of Luria's (1961) observations of the verbal regulation of motor behavior in hyperactive children. The program consisted of training the use of simple verbal commands before performing each of a variety of training tasks. Using a sampe of hyperactive boys, Palkes et. al. (1968) found that relative to an attention-control group, the training group improved their Porteus Maze performance as measured by both the qualitative score (impulsivity measure) and the quantitative score (general intelligence measure). In a later study, Palkes et al. (1971) also used hyperactive boys in examining the relative efficacy of training self-instructions by requiring overt verbalizations versus silent reading of the commands. The results showed that Ss trained to verbalize overtly the self-instructions improved their Porteus Maze qualitative performance in comparison to Ss trained to read silently the self-instructions and Ss in an attention-control condition.

The Meichenbaum and Palkes training programs offer a promising approach for dealing with the problems of impulsive and hyperactive children. Their research suggests that there is considerable clinical value in training the use of self-instructions by these children. On the other hand, some data from their own and other studies raise important questions about the behaviors that mediate appropriate task performance

and the role of self-instructional verbalizations in producing improved performance.

Attentional Behavior

Meichenbaum (1973) has pointed out that one reason for employing a self-instructional format for training impulsive children is the observation that these children use private speech in an inefficient and ineffective manner. Naturalistic observations (Meichenbaum, 1971) and experimental studies (Bates & Katz, 1970; Meichenbaum & Goodman, 1969) show that impuslive children display infrequent use of self-directive speech and poor verbal control over nonverbal behavior. The Meichenbaum and Palkes training programs are directed at remediating these speech-motor deficits by teaching self-instructional control. In other words, self-directive speech is viewed as the important mediator of nonverbal task behavior and its correction as mediating improved task performance.

On the other hand, the verbal-motor deficit is not the only factor that distinguishes the impulsive child. The evidence shows that the impulsive child differs from the non-impulsive child in the attentional behaviors displayed on matching-to-sample and other tasks. Thus, in comparison to non-impulsive children, impulsive children display more limited and greater inequality of visual scanning (Drake, 1970; Nelson, 1968; Siegelman, 1969), distribute proportionately less of their attention to comparison of stimulus-pairs (Ault, Crawford & Jeffrey, 1972; Zelniker, Jeffrey, Ault & Parsons, 1972), and display inefficient and deficient performance on

tasks requiring careful attention (Katz, 1971; McKinney, 1973; Nuessele, 1972). These studies suggest that deficient attentional behaviors may account entirely for the poor task performance of impulsive children.

The major implication of these findings, however, is that the remediation of children's impulsive behavior should directly modify deficient attentional behaviors. For example, Nelson (1968), using fourth-grade impulsive boys, verbalized appropriate attentional behaviors and directly worked with the Ss in seeking the one variant that was the exact match to the standard. In contrast to attention-control Ss yoked to the training Ss, the training group showed increased MFF time and reduced MFF errors. Albert (1969) also directly trained second and third-grade impulsive children to visually scan the matching-to-sample stimuli and eliminate incorrect variants before responding. In contrast to a no-training control group and a group instructed to "take their time and 'think' before responding," the training group displayed improved MFF performance on the posttest. Finally, Seggev (1972) uses second and fourth-grade impulsive boys in comparing the effects of a visual scanning training program and an attention-control condition. The results showed the superiority of the training group on posttest MFF performance.

These studies demonstrate the treatment efficacy of directly modifying the attentional behaviors of impulsive children on matching-to-sample tasks. They also raise the question of the target behavior in the Meichenbaum and

Palkes training program: self-instructional verbalizations or appropriate attentional behaviors? This question is examined in the present study by comparing a self-instructional training program and a direct training program that omits the self-instructional component.

Role of Self-Instruction

The proposition that self-instructions are trained and used by children in the Meichenbaum and Palkes programs would be strengthened by independent evidence of the phenomenon. Unfortunately, the design of their studies does not permit an evaluation of the hypothesis that self-instructions guide and direct improved task performance. Meichenbaum and Goodman (1971) provide only the casual observation that three of their five self-instructional Ss "spontaneously self-verbalized" on the posttest in their second study. The content and frequency of these self-verbalizations, and the relationship to test performance are not reported. Palkes et al. (1971) have also been unable to supply evidence on the mediational function of self-instructions. In fact, they report that their self-instructional Ss "did not appear to verbalize as they threaded the mazes during posttesting (p. 341)." There is thus some doubt about the validity of the self-instructional hypothesis that the improved task performance of impulsive and hyperactive children is mediated through the training and use of self-instructions.

The present study investigates this question by audio-tape recording the verbalizations of all Ss during the

testing sessions. The verbalizations were classified into the five categories used by Kohlberg, Yaeger, and Hjertholm (1968) in their developmental study of private speech and five categories developed specifically for this study. Interjudge reliability of these data across Ss ranged from 89% to 100% agreement with a mean of 94%. Due to the low frequency of verbalizations, the categories were later combined into four major classes: task self-comments, E-directed comments, task self-instructions, and inaudible muttering. In the present study, then, the self-instructional hypothesis would be supported by relatively high frequency of task self-instructions by Ss trained to use self-instructions and high correlations between these verbalizations and improved test performance.

Method[2]

Subjects

Ss for the study were obtained for a special kindergarten classroom designed for research purposes as part of a larger project operated by a private school for Hawaiian and part-Hawaiian children. While the operation of the classroom differed from that of the typical public school class, Ss were representative of the kindergarten population in a lower socio-economic area of the city.

All Ss were administered the MFF test and impulsive Ss for the study were selected on the basis of the pretest MFF data from Meichenbaum and Goodman's (1971) second study,

i.e., one standard deviation above the mean for time and one standard deviation below the mean for errors. Any S whose pretest MFF performance met either criterion was included in the study resulting in a sample of 15 Ss, seven boys and eight girls, with a mean age of 5.87 years and a mean WPPSI IQ of 87.6. They were matched on their pretest MFF performance and randomly assigned to the three treatment groups.

Test Instruments and Sessions

Training effects were assessed by Kagan's (1966) MFF test and the Porteus (1965) Maze Tests. Performance on the MFF requires S to select one of six alternative pictures that is the exact match to the standard picture. Performance on the Porteus Maze requires S to find his way out of each maze by tracing a pencil through the alleys and avoiding errors such as touching lines and entering blind alleys. In addition, generalization effects were assessed by Raven's (1956) Coloured Progressive Matrices and the classification subtest from Cattell's (1950) Culture Fair Intelligence Test. Performance on the Matrices requires S to select one of six alternatives that best fits the missing part of a colored design. Performance on the classification test requires S to appropriately place four pictures into two categories differing on some dimension.

Two forms of each test were developed, with Form A administered in the pretest and second posttest and Form B

given in the first posttest. The pretest was administered one week prior to training, the first posttest one hour after training, and the second posttest one week after training. All testing was conducted by a female E who was unaware of the treatment to which Ss were assigned.

The performance measures for the MFF, Raven, and Cattell tests consisted of time to make first response on each item and total errors on all items. The measures for the Porteus Mazes consisted of time to complete each maze and two error scores: quantitative error score which is considered to be a measure of intelligence (Porteus, 1965) and consists of entering blind alleys and crossing into alleys, and qualitative error score which is considered to be a measure of impulsivity (Horn, 1972; Payne, 1961) and is based upon errors in style and quality of execution such as lifting the pencil and touching lines.

To maintain Ss' attention during the lengthy testing sessions, each session contained an intermission period during which refreshments were provided. In addition, each session was conducted under a token reinforcement system which involved the dispensing of one poker chip after the demonstration items of each of the four tests, one chip upon completion of the test items of each test, and two chips at the end of the session. Every S thus received 10 poker chips for each testing session, regardless of actual test performance. These tokens were later exchanged for the back-up reinforcers consisting of a slip of paper with the printed words "Special Award

for Good Work" (which, according to teacher reports, had acquired reinforcing value) and a small toy such as marbles, jacks, etc.

Treatments

Ss in all treatment groups were seen individually in two 30-minute training sessions separated by one hour. The intermission period and token system used in the testing sessions were also employed in training with the same purpose of maintaining the Ss' attention and interest during the lengthy sessions. The training materials consisted of tasks that were simple versions of the MFF and Porteus tests, i.e., modifications of items selected from Test 8 (Similarities) and Test 3 (Mazes) of Cattell's (1950) Culture Fair Intelligence Test. All Ss were exposed to these materials in the training sessions which were audio-taped for later analysis of the training procedures. Records were also maintained on Ss' performance on the training tasks in the second session.

Finally, as in the Meichenbaum and Goodman (1971) program, all Ss were given the following statement at the end of the second session: "Can you remember to do exactly what we did whenever you do things like this? Remember to go slow and be careful".

Self-Instructional Training. Ss in this condition received training in the use of verbal self-instructions to guide their task performance. The training program was modeled after those reported by Meichenbaum and Goodman (1971), Palkes et al. (1968), and Ridberg, Parke, and Hetherington (1968). It consisted of five phases spread over the two training sessions. In each phase, E first modeled appropriate task behavior including self-instructional

statements. On four of the modeling trials, E deliberately made an error and displayed appropriate coping behavior, as in the Meichenbaum and Goodman (1971) program. S was given practice trials on similar tasks, during which S was verbally prompted to emit the self-instructions and reinforced by praise.

In Phase 1, general self-instructions applicable to both matching-to-sample and maze tests were trained through the use of simple motor tasks. These self-instructions consisted of the statements: "Stop and think before I begin", "What do I have to do?", and "Go slow, be careful".

In Phase 2, self-instructions relevant to matching-to-sample tasks were trained through the use of simple versions of Cattell's Similarities Test items. The self-instructions consisted of (1) statements directing S's attention to various parts of the task such as "Look at everyone", "Look here", and "Look back", and (2) statements pointing out differences and similarities between the standard and the variants such as "Same or different?", "The arm is different", "The head is the same". The shifts in E's visual attention during the modeling trials were accompanied by the use of a rod pointer, as in the Ridberg et al. (1968) program.

In Phase 3, self-instructions appropriate to maze tasks were trained through the use of simple versions of Cattell's Mazes Test items. The self-instructions consisted of (1) statements directing S's pencil movements such as "Stay away from the lines", "Keep the pencil on the paper", "Watch the

corner", and "Keep the line straight", and (2) statements relating to looking and planning ahead such as "Now, where do I go? If I go down here, I'll get stuck. If I go up here, I'll get stuck too. So, I have to go in here." After each S practice trial, E pointed out errors and their correction.

Phase 4 consisted of training self-instructions applicable to matching-to-sample tasks through the use of complex versions of Cattell's Similarities Test items. Phase 5 consisted of training self-instructions appropriate to maze tasks through the use of complex versions of Cattell's Mazes Test items. In each of these phases, E provided only one modeling trial while S was given five progressively more difficult practice trials.

Self-Instructional (SI) training was thus designed to teach Ss to employ self-instructional verbalizations to guide their performance on matching-to-sample and maze tasks. The training program gradually progressed from general self-instructions on simple tasks, to task-specific self-instructions on simple tasks, and finally to task-specific self-instructions on complex tasks that approximated the MFF and Porteus test items. If S failed to verbalize the appropriate self-instruction, he was verbally prompted by E and, in some instances, physically restrained from continuing until the self-instruction was verbalized. Finally, E's assistance in the form of modeling, verbal prompts, and verbal praise was gradually faded over the course of the five training phases.

Direct Training. Phase 1 for Ss in the direct training (DT) group consisted of instructions that whenever they are asked to perform any task, they are to do three things: (1) stop and think before beginning; (2) know what they have to do; and (3) go slow and be careful. Ss were then given practice trials on the same motor tasks as SI Ss with E providing the instructions prior to each task. Contingent verbal praise was provided for performance in this phase as well as in the rest of the training program.

The other phases of DT training were the same as those of SI training with two major exceptions. First, DT modeling trials did not contain the error component of SI training, i.e., E modeled error-less performance for the DT Ss. The more important exception, however, was that during S practice trials, E did not prompt or reinforce the use of self-instructions. That is, instead of prompting S to self-instruct (e.g., "Say: 'Go slow, be careful'.") as in SI training, E directly prompted the DT S to engage in the relevant task behavior (e.g., "Go slow, be careful") and verbally praised their emission.

Attention-Control. The attention-control (AC) Ss were seen by E in the two training sessions and allowed to practice on the same task materials as the SI and DT Ss. To equate time spent during the sessions, the AC Ss were also given additional matching-to-sample and maze items. However, they did not receive any of the training components of the other two conditions. That is, no modeling trials

were provided, no verbal prompts for appropriate task behaviors or self-instructions were given, and no systematic and contingent verbal praise was programmed. The Ss were simply permitted to practice on the task materials with E providing noncontingent verbal praise. Following Posttest 2, these control Ss were given SI training and Posttest 3 (Form B).

Results[3]

Training

Table 1 shows the time and error scores on the matching-to-sample and maze tasks in the second training session. One-way ANOVAs revealed significant overall F's for all measures, with both training groups different from the control group and not different from each other. These results show that the performance of the SI and DT Ss was superior to that of the AC Ss during training. The training Ss took longer and committed fewer errors on both tasks than the AC Ss.

Insert Table 1 about here

Table 2 shows the time and error scores on the MFF test for the three groups across the three testing sessions. While the data suggest increased time and reduced errors by the SI and DT Ss, 3 X 3 ANOVAs showed no significant main

or interaction effects. Posttest 3 data for the AC group reflects performance following SI training after completion of the main experiment. These data show a nonsignificant increase in time and a nonsignificant reduction in errors.

Insert Table 2 about here

Table 2 also shows the time, qualitative error, and quantitative error scores on the Porteus Mazes. Since there were pretest differences, the data were submitted to analyses of covariance (COVAR) with pretest scores as covariates. The results for Porteus time showed no significant treatment effects for either posttests, although all groups showed reduced response times across test sessions. The results for the qualitative errors showed a treatment effect approaching significance for Posttest 1 ($p < .10$, $F = 3.126$, $df = 2/11$) and a significant treatment effect for Posttest 2 ($p < .001$, $F = 17.605$, $df = 2/11$). Subsequent testing on the adjusted means with the conservative Scheffe test showed that both training groups made significantly fewer errors than the control group on Posttest 2 (p .01, $t = 5.383$). Finally, the Posttest 3 performance of the AC group following SI training showed a significant reduction in qualitative errors from Posttest 2 ($p < .05$, $t = 2.30$). Analysis of the Porteus quantitative errors revealed essentially similar

results, with a nonsignificant Posttest 1 treatment effect, a significant Posttest 2 treatment effect ($p < .05$, $F = 5.016$, $df = 2/11$) showing both SI and DT groups committing less errors than the AC group by a Scheffe test ($p < .05$, $t = 2.828$), and a nonsignificant reduction in errors on Posttest 3 by the AC group after SI training.

Generalization

Time scores for the Raven and Cattell tests showed that in general all three groups had reduced response time across the test sessions. However, COVARs showed no significant treatment effects. COVARs on the error scores showed only that there was a treatment effect on Posttest 1 for Cattell errors approaching significance ($p < .10$, $F = 3.651$) with the subsequent Scheffe test revealing only that the DT group made less errors than the SI group ($p < .05$, $t = 3.395$). This finding however is not maintained on Posttest 2 and no other treatment effects are significant. The overall picture therefore is that of non-significant treatment effects on the Raven and Cattell tests and consequently, the general absence of generalization effects.

Verbalization

The hypothesis underlying SI training is that verbal self-instructions mediate improved task performance. Meichenbaum and Goodman (1971) observed that three of their five SI Ss "spontaneously self-verbalized" on the posttest while none did so in the other treatment groups. In the present study, two of the five SI Ss self-instructed on the

MFF, three of them did so on the Porteus, none of the Raven, and three on the Cattell. On all tests during the first posttest, the SI group verbalized more self-instructions ($\bar{X}$ = 4.0) than either the DT group ($\bar{X}$ = 2.2) or the AC group ($\bar{X}$ = 1.6).

For a more precise analysis of these data, COVARs were conducted on self-instructional verbalizations with pretest verbalizations as covariates to assess group differences in the emission of these verbalizations. No significant treatment effects were found on any of the individual tests or the combined total of all tests. COVARs were also conducted on the verbalization data in the other categories and no significant treatment effects were obtained.

The failure to find group differences in self-instructional verbalizations was also confirmed by correlational analyses between frequency of self-instructions and posttest performance scores. The correlations involving the MFF data are in direct contradiction to those predicted by the self-instructional hypothesis. While nonsignificant, self-instructions correlate negatively with MFF time (r = -.06) and positively with errors (r = .45). The correlations involving the Porteus data are more encouraging, but not significant: self-instructions correlate positively with time (r = .46), qualitative errors (r = .08), and quantitative errors (r = .03). The data for the Raven and Cattell tests also present the same discouraging results for the self-instructional hypothesis. Moreover, the overall correlational matrix

between verbalizations in all categories and test performance contains low, nonsignificant relationships. This finding suggests that verbalization of any content had no relationship with either time or error measures on any of the four tests.

Discussion

The present study demonstrates the efficacy of both self-instructional and direct training programs in modifying impulsive behavior as assessed by the training records and the Porteus error measures, and shows trends in favor of these programs over the control condition on the MFF test. However, there are no significant differences between the two programs in either the training records or the posttests and there are no significant effects on the generalization tests. Most importantly, the results reveal no significant relationship between self-instructional or other verbalizations and performance on any of the tests.

The latter results are particularly discouraging in view of the previous successes of self-instructional training (Meichenbaum & Goodman, 1971; Palkes et al., 1968, 1972). In an effort to clarify these findings, the records of verbalizations of the SI subjects during the training program were examined to determine whether self-instructional control over task performance was acquired. Analysis of the available records showed that, at the end of training, the children verbalized an average of 15.7 self-instructions. On the other hand, the analysis also revealed that 85% of these

self-instructions were still being prompted by the trainer, suggesting that the children would probably not have self-instructed without external assistance. In addition, the analysis showed that only one-third of the emitted self-instructions consisted of verbalizations that serve a directive function for task performance and that all of these directive self-instructions were verbally prompted by the trainer. Moreover, informal observations of the children's behavior during training showed that they verbalized the self-instructions independently of their task responses. That is, on those rare occasions when they verbalized self-instructions without prompts by the trainer, the verbalizations were observed to be emitted in almost rote fashion with no controlling relationship to task behavior. This observation is consistent with the Miller et al. (1970) finding in a Luria bulb-pressing study that the children appeared to behave in a manner suggesting that self-verbalizing was merely another task to perform. It is also consistent with the finding by Meichenbaum and Goodman (1969) that impulsive children tended to use verbalizations on a Luria-type verbal control task in a "metronome" fashion without regulatory functions.

Taken together, these findings and observations suggest that the SI training program failed to train the children to functionally control their test behavior by the use of the self-instructions. This failure means that the SI program reduces essentially into a direct training program since the major difference between the two is the training of self-

instructions. Inasmuch as both programs were found to be effective, the present study suggests that the prior successes of SI training may not be due to the role of self-instructions. Instead, the success may be due to the training of appropriate attentional and other task behaviors through modeling, prompts, and praise.

On the other hand, the conclusion is somewhat inconsistent with the results of a similar investigation reported after the present study was completed. Robin, Armel and O'Leary (1975) found that SI training was superior to direct training in remediating writing deficiencies and that children trained to self-instruct did in fact verbalize the self-instructions during training and posttesting. While these results contradict those of the present study and appear to support the self-instructional hypothesis, other findings and features of the study obscure a clear evaluation. The investigators report a nonsignificant negative correlation between frequency of self-instructions during training and posttest performance, and do not report data on the relationship between self-instructions and performance during posttesting. Thus, while the children did self-instruct, it is unclear whether their self-instructions had any functional relationship to their test performance. In addition, confirming the observations of the present study, the investigators report difficulty in training their children to self-instruct properly. Thus, there is again suggestive evidence that SI training does not result in functional control of test perform-

ance by verbal self-instructions. Finally, Robin et al.'s direct training program differed in two important ways from their SI training program: training of self-instructions and modeling of appropriate task behavior. Thus, the finding that their SI program was superior may have been due to the modeling procedure rather than to the training of self-instructions. When modeling is included in both training programs, as it was in the present study, the functional role of self-instructions is questionable.

In the Robin et al. as well as the present study, SI training did not attempt to transfer the use of self-instructions from the overt to the covert level. Meichenbaum (1975) recently suggested that this procedural omission is inappropriate since "the goal of training is to fade the child's verbalizations, such that SI at the end of training does not look different from direct training (p. 18)." Adherence to this goal, however, creates several methodological problems. For example, as Robin et al. note, it is not clear how covert responses can be trained when their emission requires external assistance. While Meichenbaum and Goodman (1971) appeared to have taught their children to verbalize covertly, the trainers in the Robin et al. and the present study found that prompts and reinforcements were necessary for the subjects' continued emission of the self-instructions. In addition, if independent evidence of the controlling function of self-instructions is to be obtained, then it is almost mandatory that self-instructions be verbalized overtly. Since current

technology limits measurement to the overt level, a study that involves training of covert behavior (if possible) and measurement of overt behavior could lead to inconclusive data. If, for instance, the study found no evidence of the observable counterpart to the covert behavior, it could be reasonable argued that measurement was inadequate for the task.

In summary, while the present study was not an attempt to directly replicate the SI training of Meichenbaum and Goodman (1971), the results suggest that the enthusiastic claims for such training programs are probably premature. Self-instructional control of behavior in young children is difficult to train and evidence for the self-instructional control of improved performance is questionable. The present analysis also suggests that the efficacy of SI training may not be due to the use of self-instructions, but rather to the direct training of attentional and other behaviors appropriate to the task. In this respect, the real value of SI training for young children may have been to highlight the importance of certain behaviors that are not usually considered in the successful performance of complex tasks. For example, inhibition of impulsive responding and attention to all aspects of a task appear to be critical for satisfactory performance on matching-to-sample and maze tasks. On the other hand, as the present study shows, these task-related behaviors can be directly trained without the use of verbal self-instructions.

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Footnotes

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2. A detailed description of the procedures and materials is available from the author.
3. Tables on data and statistical analyses not reported here are available from the author.

TABLE 1

Training Data by Treatment Groups

Response Measure	Self-Instructional Training	Direct Training	Attention Control	F Ratio
Matching-to-Sample				
Total Time	259.10 (42.42)	215.00 (152.67)	22.26 (3.88)	9.473*
Total Errors	3.00 (2.12)	4.40 (3.58)	10.00 (3.67)	6.682**
Mazes				
Total Time	163.00 (59.42)	158.90 (67.18)	54.28 (9.72)	6.999*
Qualitative Errors	6.60 (3.72)	5.00 (2.35)	12.80 (7.40)	8.477*
Quantitative Errors	1.60 (0.89)	1.80 (1.70)	7.60 (5.41)	5.231**

Note.--N = 5 for each group, scores are mean group data, and scores in parentheses are standard deviations. Time and error data obtained from Ss' performance during second training session. Qualitative and quantitative errors scored according to Portens' (1969) criteria.

* $P < .01$, df = 2/12.

** $P < .05$, df = 2/12.

TABLE 2

Pretest and Posttest Scores for MFF and Porteus Tests by Treatment Groups

Test	Self-Instructional Training	Direct Training	Attention Control
MFF Time			
Pretest	44.13 (7.97)	43.14 (24.66)	45.30 (17.40)
Posttest 1	59.46 (18.93)	67.92 (48.53)	25.65 (8.13)
Posttest 2	65.80 (61.58)	35.81 (10.33)	30.19 (9.46)
Posttest 3	- -	- -	37.93
MFF Error			
Pretest	15.40 (3.44)	14.60 (4.16)	15.60 (5.86)
Posttest 1	11.20 (4.38)	13.80 (5.22)	15.20 (2.59)
Posttest 2	10.60 (2.30)	13.60 (7.16)	14.80 (3.35)
Posttest 3	- -	- -	13.20
Porteus Time			
Pretest	170.93 (83.69)	186.09 (65.55)	209.15 (154.48)
Posttest 1	155.84 (63.31)	145.30 (10.32)	100.64 (50.13)
Posttest 2	122.60 (33.59)	129.04 (34.16)	102.22 (26.86)
Posttest 3	- -	- -	131.02
Porteus Qualitative			
Pretest	46.80 (21.59)	38.20 (22.22)	30.60 (9.94)
Posttest 1	23.40 (14.36)	18.60 (13.45)	29.00 (10.56)
Posttest 2	19.80 (6.34)	17.00 (5.39)	39.80 (9.83)
Posttest 3	- -	- -	24.20
Porteus Quantitative			
Pretest	14.00 (8.80)	12.80 (9.93)	16.40 (15.66)
Posttest 1	4.20 (2.17)	4.80 (3.27)	8.40 (4.62)
Posttest 2	4.00 (2.92)	4.80 (2.86)	10.00 (7.55)
Posttest 3	- -	- -	4.80

Note.--N=5 for each group, scores are mean group data, and scores in parentheses are standard deviations.